AF $
/ [illegible]

920476-904811

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In the application of	:	Brian Unitt
Serial No.	:	09/584,330
Filed	:	May 30, 2000
For	:	High Capacity Passive Optical Network
Examiner	:	Shi K Li
Art Unit	:	2633
Customer number	:	23644

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box, 1450, Alexandria, VA, 22313-1450 on November 12, 2004
Name of person signing Minnie McBride
Signature Minnie McBride

APPEAL BRIEF

Honorable Director of Patents and Trademarks
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This appeal is from the Examiner's final rejection of May 13, 2004. A Notice of Appeal with extension of time were timely filed September 17, 2004 (mailed September 13, 2004). The fee of $340 pursuant to 37 C.F.R. §41.20(b)(2) is tendered herewith.

(i) Real Party in Interest

This application is assigned to Nortel Networks Limited. The assignment is recorded at Reel 011196 Frame 0550.

(ii) **Related Appeals and Interferences**

There are no related appeals or interferences.

(iii) **Status of Claims**

The application was filed with claims 1 through 20. Of these claims, claims 2 to 4, 6, 8 to 9, 12, 15 to 16 and 20 are pending as filed, claims 1, 10, 14 and 17 to 19 have been amended and claims 5, 7, 11 and 13 have been cancelled. Consequently it is the rejection of claims 1 to 4, 6, 8 to 10, 12 and 14 to 20 that is appealed. These claims as currently pending are set out in the attached Claims Appendix.

(iv) **Status of Amendments**

A response to the final Office Action mailed May 13, 2004 was filed July 13, 2004 and entered by the Examiner. The amendment of that response was to cancel claim 5 and amend claim 19.

(v) **Summary of the Claimed Subject Matter**

The present invention relates to a passive optical network arrangement comprising a head-end station and at least one subscriber station. Passive optical networks (PONs) use a shared transmission medium. Accordingly, a method of controlling stations' transmissions onto that medium is necessary to avoid collision of transmissions. It is known to use a passive optical star coupler to interconnect nodes in an optical network. In particular, it is known to use a star coupler in which an optical signal input on any input port is outputted (albeit attenuated) at all output ports.

A problem with PONs using such a passive optical star coupler is that any collision should be detected <u>before</u> a transmitting node has finished the transmission. For high speed networks, this results in a trade-off between the physical size of the network and the minimum length of the transmitted packet. Thus, for a network

running at a bit rate of 1 Gbit/s and with an overall size of 5 KM, the minimum packet size to guarantee detection of a collision is around 6 kb. This is relatively large and very inefficient for short packets which must be extended to the minimum packet size to guarantee detection of possible collisions. A significant proportion of packets (such as those used for voice and TCP/IP acknowledgements) will be very much shorter than 6 kb. Thus, such networks use their bandwidth inefficiently. Furthermore, as network speeds increase, the problem of inefficiency due to requiring all transmissions to be of a minimum length is exacerbated. See page 2, line 4 to page 3, line 12 of the specification for further explanation.

A further problem with PONs is that, by definition, no active electronics may be included in between the head-end station and the subscriber stations. Thus, collision detection circuitry must be implemented in the subscriber stations. However, to duplicate collision detection circuitry at every subscriber station can be expensive.

The present invention provides an ingenious solution to the problems of efficiency and economy identified above by providing a passive optical network arrangement as set out in currently pending claim 1. In summary, the invention as presently claimed has subscriber stations arranged to transmit on a common optical frequency distinct from that on which the head-end station is arranged to transmit and arranges each subscriber station to detect whether another of said subscriber stations is transmitting on said common optical frequency by arranging the PON to provide optical connectivity from each of said stations to each other station but no optical connectivity from each of said stations back to itself. Thus, simple collision detection circuitry may be employed at the subscriber stations, since any transmission received by a subscriber station on the common optical frequency during the subscriber station's own transmission indicates collision. Further, the requirement for extended transmission lengths is reduced since collisions between upstream transmissions from subscriber stations and downstream transmissions from the

head-end station are eliminated and, thus, the subscriber stations need only use transmissions of a length required to ensure that any collision is detected by other subscriber stations. Since subscriber stations are likely to be much closer to each other (say within 250 meters of each other) than to the head end station (which may be typically 5 KM away) this results in a significant reduction in the transmission length requirement and therefore efficiency of the PON.

(vi) **Grounds of Rejection To Be Reviewed on Appeal**

The following issues are presented:-

1. That claims 1 to 4, 6, 8 to 10, 12, 14 and 16 to 18 are obvious (under 35 USC §103(a)) over Darcie (US 6,493,335) in view of Ota (US 5,282,257) and Ota (US 5,915,054).
2. That claim 15 is obvious (under 35 USC §103(a)) over Darcie, Ota '054 and Ota '257 further in view of Kavehrad (US 4,701,909).
3. That claims 19 and 20 are obvious (under 35 USC §103(a)) over Darcie, Ota '054 and Ota '257 further in view of Coden (US 5,109,448).

(viii) **Argument**

Issue 1: As discussed above, the invention as presently claimed addresses the problem of economy and efficiency in implementing PONs having a head-end station and one or more subscriber stations. The present invention teaches that by arranging the PON to provide optical connectivity from each of said stations to each other station but no optical connectivity from each of said stations back to itself AND by arranging subscriber stations to transmit on a common optical frequency distinct from that on which the head-end station is arranged to transmit, simple collision detection circuitry can be employed in the subscriber stations which is both economical and efficient in terms of only requiring a relatively short packet length to be transmitted for reliably detecting collision.

The primary reference cited by the Examiner is Darcie. Darcie teaches a communication network that uses intermediate nodes to resolve local traffic contention. Intermediate nodes receive upstream signals from end users, derive traffic information signals from the upstream signals, and transmit the traffic information signals from end users. By listening to the traffic information signals from the intermediate node, the end users know whether the upstream transmission channels are idle or busy, or whether a collision has occurred. See the abstract generally. Each of the various embodiments of Darcie shares the common feature that intermediate nodes are used to resolve traffic contention. However, a PON, by definition, requires passive equipment between subscriber stations and a head-end station. The teaching of Darcie recognizes this fact and at column 17, lines 11 to 16, Darcie states

> "alternatively, to maintain the passive nature of the PON, another approach is to use different wavelengths or different sub-carriers for upstream and downstream transmission and passively loop back upstream signals for traffic indication purposes.".

At column 17, lines 22 to 31, Darcie continues

> "... if upstream and downstream transmission use different wavelengths, the upstream light is collected over the unused trunk port of the optical splitter 150 or 150b, coupled to the downstream trunk port 151 or the unused trunk port of the other splitter 150a and broadcast downstream. Therefore, the EU [end user] will receive downstream data on one wavelength and the TIS [traffic information signal] on the other wavelength, which is the same as that of upstream. EU 20 could compare the received TIS, which is the upstream data, with its transmitted data to monitor the traffic condition.".

Darcie teaches away from the Present Invention

In this PON related embodiment of Darcie, it is a mandatory requirement that each end user station receives back the data it transmits upstream (i.e. towards the head-end station) as a traffic information signal (TIS). Collision detection is performed by the end user station comparing the signal it transmits upstream with the received TIS. Thus, it is clear that the relevant embodiment of Darcie (and indeed all embodiments of Darcie) teaches away from the claimed feature of the present invention that the PON is arranged to provide no optical connectivity from each of said stations back to itself. The Examiner has admitted that Darcie fails to teach the feature of the passive optical network providing no optical connectivity from each of the stations back to itself (see paragraph 6 of the final Office Action dated 05/13/2004).

Darcie does not address the problem addressed by the Present Invention

Furthermore, although Darcie does teach the use of different wavelengths for upstream and downstream transmission, it does not address the problem addressed by the present invention. Namely, it does not address the problem of economy and efficiency in implementing collision detection mechanisms in a PON.

No combination where prior art teaches away from claimed invention

The Examiner rejects each of the currently pending claims under 35 USC §103(a) by way of a combination of Darcie and two further prior art references Ota '257 and Ota '054. However, it is a well recognized principle of patent law that an invention will not be deemed obvious when one or more prior art references teach away from the invention. In *In Re Gurley,* 31 USPQ 2d 1130, 1131 (Fed. Cir. 1994) the court stated that:

> "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in

It is clear as a matter of fact that Darcie requires optical connectivity from each station back to itself. Without this, none of the embodiments of Darcie would work. Therefore, as a matter of law, the Examiner's rejection of the currently pending claims of the present application is unsustainable. One skilled in the art would not be motivated to combine Darcie, Ota '257 and Ota '254 since Darcie clearly teaches away from the present invention.

No motivation to combine

Even if it was considered that Darcie does not teach away from the present invention, which is strongly denied, one skilled in the art would not be motivated to combine the references for the following reasons. Darcie and the present invention relate to directional network topologies - i.e. the PON of Darcie and the present invention have a central office or head-end station and a plurality of end users or subscriber stations. Ota '054 and Ota '257, however, do not relate to such directed topology networks. Furthermore, Ota '054 and Ota '257 relate to active optical networks - i.e. optical networks employing active electronics such as relay amplifiers between nodes (see for example Ota '054 col 2, lines 11-24). Thus, one skilled in the art when addressing the problem addressed by the present invention - namely, the economy and efficiency of PONs - would not be motivated to consult either of Ota '054 or Ota '257.

Moreover, even if one skilled in the art were ever motivated to consult these references, which is denied, he or she would not consider them pertinent to the problem being addressed. Ota '257 addresses the problem that optical networks cannot easily be expanded by connecting a plurality of star couplers together because interconnection between star couplers results in forming a closed loop within the transmission path and this causes phenomenas such as oscillation and attenuating vibration (column 2, line 16-19). Ota '054 addresses the same problem.

> "... as the number of nodes coupled with the star coupler is increased, the level of a receiving signal is decreased in each node. One of the possible ways to solve the level down problem is to extend the network by additionally using star couplers and relay amplifiers. This approach suffers from another problem, however. The star coupler, when receiving a signal from a node, sends it also to the receiving port of the same node. Accordingly, a feedback loop is formed between the star couplers interconnected. If a relay amplifier is located between the star couplers, an oscillation occurs." (Ota '054 col 2, lines 11 to 24).

Thus, both Ota '054 and Ota '257 address the problem of <u>network expansion</u> and, in particular, the problem of oscillation resulting from closed loops being formed comprising relay amplifiers. This is of no relevance to the specific problem addressed by the present invention of economy and efficiency in a passive directional topology such as a PON in which the head-end station may be located far away from the subscriber stations. Accordingly, one skilled in art would not be motivated to combine the teachings of Darcie with those of Ota '257 and Ota '054 as argued by the Examiner.

In the Advisory Action dated 07/23/2004, the Examiner argues that "Ota '257 teaches in col 8, lines 3-6 that the bidirectionality of the coupler can readily be utilized for collision detection." The Examiner is incorrect. Taking the whole paragraph beginning col 7, line 62 and ending col 8, line 6 in context, this passage merely teaches that the bidirectionality <u>of the single optical fiber</u> can be readily utilized for collision detection. There is no such thing as a "bidirectional coupler".

Issues 2 and 3: The Examiner's rejection of claims 15, 19 and 20 is based on the combination of Darcie, Ota '257 and Ota '054, together with future prior art references. These rejections are moot in view of the above.

For the reasons set out above, applicants submit that the Examiner's rejection of each of the currently pending claims cannot be sustained, and reversal is urged.

November 12, 2004

Respectfully submitted,

William M. Lee

William M. Lee, Jr.
Registration No. 26,935
Barnes & Thornburg LLP
P.O. Box 2786
Chicago, Illinois 60690-2786
(312) 214-4800
(312) 759-5646 (fax)

CLAIMS APPENDIX

1. A passive optical network arrangement comprising:

a head-end station;

at least one subscriber station;

a passive optical network providing optical connectivity from each of said stations to each other station, but no optical connectivity from each of said stations back to itself;

wherein said subscriber stations are arranged to transmit on a common optical frequency distinct from that on which said head-end station is arranged to transmit, and each of said subscriber stations is arranged to detect when another of said subscriber stations is transmitting on said common optical frequency over said passive optical network.

2. A passive optical network arrangement according to claim 1 in which the subscriber station communicates with the head-end station using a carrier sense/collision detection protocol.

3. A passive optical network arrangement according to claim 2 in which the protocol is an Ethernet protocol.

4. A passive optical network arrangement according to claim 2 in which the protocol operates at bit rates of the order of 1Gbit/s or above.

5. (Canceled)

6. A passive optical network arrangement according to claim 1 in which said passive optical network comprises:

a passive star coupler connected by means of point-to-point optical links to each of the stations.

7. (Canceled)

8. A telecommunications access network comprising a passive optical network arrangement according to claim 1.

9. A telecommunications network comprising a passive optical network arrangement according to claim 1.

10. An optical transceiver arrangement comprising:

a transmitter arranged to transmit data only on a first optical frequency;

a transmission detector arranged to detect, only on said first optical frequency, signals from a network indicative of a transmission by another optical transceiver arrangement on said first frequency;

a medium access logic unit arranged to prevent transmission on said first frequency while said transmission detector is detecting any non-zero signals on said first frequency from a network indicative of a transmission by another subscriber station; and

a receiver arranged to receive broadcast data on a second optical frequency.

11. (Canceled)

12. An optical transceiver arrangement according to claim 10 in which the station comprises:

a common input port arranged to receive both said signal on said first optical frequency and said signal on said second frequency;

an optical frequency splitter arranged to provide said signal on said first frequency to said transmission detector and said signal on said second frequency to said receiver.

13. (Canceled)

14. An optical transceiver arrangement according to claim 10 in which the transmission detector comprises a simple light detector.

15. An optical transceiver arrangement according to claim 14 in which the light detector comprises a PIN diode.

16. A communications network comprising an optical transceiver according to claim 10.

17. A method of operating a passive optical network arrangement comprising:

a head-end station;

at least one subscriber station;

a passive optical network providing optical connectivity from each of said stations to each other station;

comprising the steps of:

at least on of the subscriber station transmitting on an optical frequency common to the subscriber stations and distinct from that on which said head-end station is arranged to transmit;

at least one of the subscriber stations detecting when another of said subscriber stations is transmitting over said passive optical network by detecting any non-zero signals on said common optical frequency.

18. A method of operating an optical transceiver arrangement comprising:

transmitting data only on a first optical frequency;

detecting signals from a network indicative of a transmission by another optical transceiver arranged by detecting any non-zero signals on said first frequency;

preventing transmission on said first frequency while said transmission detector is detecting said signals from a network indicative of a transmission by another subscriber station and

receiving broadcast data on a second optical frequency.

19. A passive optical network arrangement according to Claim 1 in which the passive optical network comprises a passive optical coupler comprising:

a plurality of input and output port pairs;

and arranged to couple each of said input ports to the output port of each other input and output port pair.

20. A passive optical network arrangement according to Claim 19 in which the passive optical coupler comprises:

a plurality of input ports each having a corresponding output port;

wherein each input port is coupled to all output ports other than its corresponding output port.